UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 18, 2017

Mr. James J. Hutto
Regulatory Affairs Director
Southern Nuclear Operating Co., Inc.
P.O. Box 1295, Bin 038
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT (CAC NOS. MF7924 AND MF7925)

Dear Mr. Hutto:

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses (ADAMS Accession No. ML12056A046). Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

By letter dated December 21, 2016 (ADAMS Accession No. ML16356A538), Southern Nuclear Operating Company, Inc. (the licensee) submitted the mitigating strategies assessment (MSA) for Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley). The MSAs are intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events. The purpose of this letter is to provide the NRC's assessment of the Farley MSA.

Enclosure 1 transmitted herewith contains Security-Related Information. When separated from Enclosure 1, this document is decontrolled.

J. Hutto

The NRC staff has concluded that the Farley MSA was performed consistent with the guidance described in Appendix G of Nuclear Energy Institute 12-06, Revision 2, as endorsed by Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, and that the licensee has demonstrated that the mitigation strategies are reasonably protected from reevaluated flood hazards condition for beyond-design-basis external events. This closes out the NRC's efforts associated with CAC Nos. MF7924 and MF7925.

If you have any questions, please contact me at 301-415-1617 or at Frankie.Vega@nrc.gov.

Sincerely,

Frankie Vega, Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Enclosure:
1. Staff Assessment Related to the Mitigating Strategies for Farley (Non-Public)
2. Staff Assessment Related to the Mitigating Strategies for Farley (Public)

Docket Nos.: 50-348 and 50-364

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STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO MITIGATION STRATEGIES FOR JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2, AS A RESULT OF THE REEVALUATED FLOODING HAZARD NEAR-TERM TASK FORCE RECOMMENDATION 2.1- FLOODING CAC NOS. MF7924 AND MF7925

1.0 INTRODUCTION

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses (ADAMS Accession No. ML12056A046). Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). That order requires holders of operating reactor licenses and construction permits issued under 10 CFR Part 50 to modify the plants to provide additional capabilities and defense-in-depth for responding to beyond-design-basis external events, and to submit to the NRC for review a final integrated plan that describes how compliance with the requirements of Attachment 2 of the order was achieved. In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

The NRC staff and industry recognized the difficulty in developing and implementing mitigating strategies before completing the reevaluation of flood hazards. The NRC staff described this issue and provided recommendations to the Commission on integrating these related activities in COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flood Hazards," dated November 21, 2014 (ADAMS Accession No. ML14309A256). The Commission issued a staff requirements memorandum on March 30, 2015 (ADAMS Accession No. ML15089A236), affirming that the Commission expects licensees for operating nuclear power plants to address the reevaluated flood hazards, which are considered beyond-design-basis external events, within their mitigating strategies.

Nuclear Energy Institute (NEI) 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16005A625), has been endorsed by the NRC as an appropriate methodology for licensees to perform assessments of the mitigating strategies against the reevaluated flood hazards developed in response to the March 12, 2012, 50.54(f) letter. The guidance in NEI 12-06, Revision 2, and Appendix G in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. The NRC's endorsement of NEI 12-06, including exceptions, clarifications, and additions, is described in NRC Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML15357A163). Therefore, Appendix G of NEI 12-06, Revision 2, describes acceptable methods for demonstrating that the reevaluated flooding hazard is addressed within the Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley) mitigating strategies for beyond-design-basis external events.

2.0 BACKGROUND

By letter dated October 21, 2015 (ADAMS Accession No. ML15294A530, nonpublic), Southern Nuclear Operating Company, Inc. (the licensee) submitted its flood hazard reevaluation report (FHRR) for Farley. By letter dated December 10, 2015 (ADAMS Accession No. ML15343A379), the NRC issued an interim staff response (ISR) letter to summarize the staff's assessment of the licensee's FHRR (ADAMS Accession No. ML15294A530) for Farley. The ISR letter provided the reevaluated flood hazard mechanisms that exceeded the current design basis (CDB) for Farley, which were to be used as suitable input for the mitigating strategies assessment (MSA). For Farley, the following mechanisms are listed as not bounded by the CDB in the ISR letter:

- Local intense precipitation (LIP); and
- Combined effects flooding from a Probable Maximum Flood (PMF) with embankment seepage and piping dam failure with wind-induced waves.

The NRC staff subsequently issued the staff assessment of the FHRR for Farley by letter dated November 4, 2016 (ADAMS Accession No. ML16288A150) containing additional details supporting the NRC staff's conclusions summarized in the ISR letter. The NRC staff review of the flood event duration (FED) and associated effects (AE) parameters associated with the LIP and combined effects hazards is provided below.

By letter dated March 28, 2017 (ADAMS Accession No. ML16356A538), Southern Nuclear Operating Company, Inc. (the licensee) submitted the Farley MSA for review by the NRC staff. The MSA is intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events.

3.0 TECHNICAL EVALUATION

3.1 Mitigating Strategies under Order EA-12-049

The NRC staff evaluated the Farley strategies as developed and implemented under Order EA-12-049, as described in the licensee's Final Integrated Plan (FIP) dated December 13, 2016 (ADAMS Accession No. ML16348A559). The NRC staff's safety evaluation for Farley is dated April 24, 2017 (ADAMS Accession No. ML17090A457). The Farley safety evaluation concluded that the licensee has developed guidance and proposed design that, if implemented appropriately, will adequately address the requirements of Order EA-12-049.

A brief summary of Farley's FLEX strategies, as described in the FIP, is listed below:

During removal of decay heat, the makeup water to the steam generators (SGs) is initially provided by the turbine driven auxiliary feedwater (TDAFW) pumps taking suction from the protected portion of the condensate storage tank (CST). Prior to depletion of the CST, an operator will initiate makeup to the CST from the reactor makeup water storage tank (RMWST) or refueling water storage tank (RWST).

Operators can transition the SG water supply from the TDAFW pumps to portable FLEX pumps using water from the onsite clean water inventory and ultimately from the ultimate heat sink, which is the service water (SW) pond, using water purification equipment supplied from the off-site National Strategic Alliance of FLEX Emergency Response (SAFER) Response Center (NSRC).

In order to maintain sufficient borated RCS inventory, boron injection (BI) FLEX pump skids at both units will be re-powered using FLEX diesel generators. The boric acid tanks, two at each unit, are the primary suction source for the FLEX BI pumps. The RWST is also available as a source of borated RCS makeup water if needed.

The site has redundant FLEX diesel generators that can provide the power required for vital instrumentation and all FLEX equipment. The FLEX diesel fuel supply is provided by on-site fuel oil storage tanks, which are not affected by a flooding event.

The control room indications of vital instruments are initially powered by the station batteries and eventually by the FLEX diesel generators.

To maintain spent fuel pool (SFP) cooling capabilities, makeup to the SFP can be added using a diesel-driven SFP FLEX pump taking suction from the SW pond. Makeup will maintain a sufficient amount of water above the top of the fuel assemblies for cooling and shielding. When supplemented by portable equipment delivered from the NSRC, water from the Chattahoochee River can be used to replace depleted water inventories.

For Phases 1 and 2, no actions are required to maintain containment pressure below design limits and no actions or systems are needed to ensure continued containment function. Containment pressure and temperature both remain acceptable, at relatively low values, without any active containment cooling. In Phase 3, a low-pressure, high-flow pump provided by the NSRC can be used to supply water from the SW pond to the containment coolers, if needed.

3.2 Evaluation of Current FLEX Strategies

By letter dated March 28, 2017 (ADAMS Accession No. ML16356A538), the licensee submitted the Farley MSA for review by the NRC staff. The MSA is intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events. All water levels and elevations for this staff assessment (with the exception of interior elevations in the auxiliary buildings) are based on the National Geodetic Vertical Datum of 1929 (NGVD29) unless otherwise noted.

Local Intense Precipitation (LIP)

For LIP, the maximum reevaluated flood hazard water level in the power block (155.35 feet (ft.) at diesel generator door D-723) exceeds the FLEX design-basis elevation (154.5 ft.). The licensee's LIP calculation estimates that the maximum reevaluated LIP flood elevation exceeds the finish floor elevation (FFE) at seven door locations for the auxiliary buildings of Units 1 and 2. The total flood water volume estimated by the licensee's analysis to flow through these seven doors results in a maximum flooding depth of 0.44 ft. and 0.28 ft. in the TDAFW pump rooms of the Unit 1 and Unit 2 auxiliary buildings, respectively. Each TDAFW pump is mounted on a pedestal 2 ft. above the floor, protected by a 0.5 ft. flood protection curb. Based on the licensee's interior flooding analysis, therefore, LIP flood water will stay below the flood protection curbs and TDAFW pump pedestals.

The FLEX BI pumps and RCS makeup pumps are located on the 100 ft. elevation of the auxiliary buildings on 0.625 ft. pedestals. Switchgear rooms (229 and 233 at Unit 1, 2229 and 2233 at Unit 2) on the 121 ft. elevation of the auxiliary buildings, and load center rooms (343 and 335 at Unit 1, 2343 and 2335 at Unit 2) on the 139 ft. elevation of the auxiliary buildings, all house electrical components that are critical to FLEX strategies. These components sit at a minimum of 0.5 ft. above the floor. The licensee's interior flooding analysis shows that LIP flood waters do not challenge the function of these pumps and components during a FLEX scenario.

Within the first 2 hours of an extended loss of all alternating current (ac) power (ELAP), doors PA109, PA121, and D-2436 are required to be opened for ventilation per the licensee's FLEX strategy. The maximum flooding depth at these doors is 0.10 ft. or less, and the maximum flood event duration is no more than 0.8 hours. Therefore, operators will not be prevented from opening these doors within the first 2 hours of the ELAP.

Maximum flooding depths and velocities at points along the FLEX equipment haul paths will delay, but not prevent the deployment of FLEX equipment. The licensee determined that the time required to clear debris from haul paths following a LIP event is bounded by the time required to clear debris from a tornado or hurricane; therefore, all FLEX time-sensitive actions can still be met.

Combined Effects Flooding Hazard

For the combined effects flooding mechanism (PMF with dam failure with wind-induced waves), the maximum reevaluated stillwater flood elevation [redacted] and the flood elevation including wave run-up [redacted] exceed both the FLEX design-basis PMF elevation [redacted], and PMF plus wave run-up elevation [redacted] along the Kontek vehicle barrier system (VBS) at Farley. However, the VBS effectively prevents wave action from propagating to the plant's safety-related buildings, and the maximum stillwater flood elevation [redacted] is below the 155.0 FFE of the safety-related structures. Therefore, although portions of the FLEX haul paths would be inundated by this event, the FLEX strategy can be implemented as designed by either pre-deploying FLEX equipment prior to the onset of flooding or delaying the deployment of FLEX equipment until after the flood waters recede.

In summary, no significant changes are required to be made to the licensee's FLEX strategies for the reevaluated LIP flood hazard or combined effects flooding hazard. The licensee identified some minor procedural and physical modifications to mitigate these flooding hazards, which are discussed in Section 3.3 of this staff assessment.

3.2.0 Confirmation of the Flood Hazard Elevations in the MSA

As stated in the FHRR, the peak water elevations for two reevaluated flood-causing mechanisms were higher than the current design basis (LIP and dam failure). For the dam failure flood-causing mechanism, the NRC staff confirmed values in the MSA match those in Table 2 of the site's ISR letter without change. However, peak water elevations for the LIP flood-causing mechanism vary between the MSA and the ISR letter.

In its MSA letter, the licensee described a reanalysis of their LIP scenario using an updated version (Build No.16.02.14) of the FLO-2D model software, resulting in decreasing flood elevations as compared to Table 2 of the ISR letter. These differences are summarized in Tables 3.2.0-1 and 3.2.0-2 of this assessment. The licensee used the same hydrodynamic model as described in their FHRR, but incorporated the following features into the model:

- Units 1 and 2 Auxiliary, Containment, Turbine and Diesel Generator Building roof drains and parapets;
- Storm drains;
- Access road culverts;
- FLEX dome;
- West and south parking lots;
- Support building parking lot;
- Units 2 auxiliary building doors D-2442 and D-2443 entrance way roof;
- Diesel generator doors D-721 and D-724 entrance way roofs; and
- Service water intake structure door D-855 adjacent ground surface.

By adding the additional roof drains and parapets, storm drains, and access road culverts, the updated model could account for more conveyance, which resulted in a reduction in the maximum flood elevations at various locations compared to the FHRR values.

The licensee applied the same FHRR rainfall scenario for the LIP event. The model scenario is based on a 1-hour, 1-square-mile probable maximum precipitation (PMP) using the guidelines provided in National Oceanic and Atmospheric Association's (NOAA's) Hydrometeorological Reports (HMRs) 51 (NOAA, 1978) and 52 (NOAA, 1982). The total cumulative PMP depth is 19.33 inches. The licensee distributed the rainfall over time using guidance provided in HMR 52, with the most intense rainfall rate of 6.2 inches during the first five minutes of the storm event. The licensee stated that since the 1-square-mile PMP would encompass the entire contributing drainage area of Farley Nuclear Plant, using a longer-duration storm would not be warranted. The NRC staff reviewed the licensee's estimation of the PMP values and its distribution during the original FHRR review and concluded in its staff assessment that the licensee's LIP scenario is reasonable for the purposes of the MSA as it follows the guideline provided by NUREG/CR-7046, "Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America".

The licensee's FLO-2D model consists of 117,445 10-ft. by 10-ft. square grid elements. The licensee stated that the 10-ft. by 10-ft. grid size was chosen to provide an adequate level of detail to reflect the hydrodynamic effects at the site. The licensee developed a Digital Elevation Model using Light Detection and Ranging (LiDAR) and as-built drawings of the site. Based on the review of the Geographic Information Systems (GIS) maps provided by the licensee as part of the FHRR review, the NRC staff determined that the model domain and boundaries are adequate to capture the effects of runoff from the plant buildings and surrounding areas

The licensee used field-verified orthoimagery of the site to estimate the Manning roughness values. The licensee used a Manning roughness coefficient of 0.32 for dense grass and vegetation, 0.35 or 0.40 for shrubs and pasture, 0.035 for asphalt or concrete, 0.03 for buildings, 0.05 for gravel, and 0.02 for water surfaces to account for friction losses. The staff determined as part of the FHRR review, that the licensee's selection of the Manning roughness values is acceptable as they followed guidelines in the FLO-2D manual.

The licensee provided the maximum flood elevations at 18 selected monitoring locations near safety-related doors and at major haul pathways. Figure 3.2.0-1 displays the spatial distribution of the maximum flood elevations within the model area. Table 3.2.0-2 provides the maximum flood elevations for various locations.

In summary, the NRC reviewed the licensee-provided LIP FLO-2D model input and output files and confirmed the maximum flood elevations reported in the MSA letter. The staff performed a confirmatory run of the licensee-provided model and found no numerical instability in its solution, or any water budget errors. Therefore, and based on the review discussed above, NRC staff conclude the licensee's updated LIP modeling results are acceptable for use in the MSA.

3.2.1 Evaluation of Flood Event Duration

The NRC staff reviewed information provided by the licensee regarding the flood event duration (FED) parameters needed to perform the MSA for flood hazards not bounded by the CDB at the Farley site. The FED parameters for the flood-causing mechanisms not bounded by the CDB are summarized in Table 3.2.1-1 of this assessment.

For the LIP flood-causing mechanism, the licensee states in its MSA letter that warning time for LIP is not credited (not applicable) in the flood protection strategy since only permanent/passive flood protection measures are relied on; therefore, no warning time was considered as part of the MSA. The staff notes that this approach is consistent with guidance provided by Appendix G of NEI 12-06, Revision 2. The NRC staff also notes the licensee has the option to use NEI 15-05, "Warning Time for Local Intense Precipitation Events" (ADAMS Accession No ML15104A158), to estimate warning time (as needed) for further analyses.

The licensee used results from the revised FLO-2D model, as described in its MSA letter, to determine the periods of inundation and recession. The licensee reported that the maximum period of LIP inundation is 1.4 hours. The licensee reported that the maximum time necessary for LIP-related flood waters to recede from the site would be 1.9 hours.

For the dam failure flood-causing mechanism combined with PMF, embankment seepage, and run-up, the license developed FED parameters based on results provided from the U.S. Army Corps of Engineers (USACE). The development and NRC staff review of the USACE models are discussed in the FHRR staff assessment. Based on these previously-reviewed results, the licensee reported a warning time of 47 hours. The licensee further reported that the period of site inundation due to this combined effect hazard is approximately 15 hours. Since the combined effect hazard does not inundate plant buildings, the licensee assumed an instantaneous recession time of 0 hours for their plan to deploy the FLEX equipment.

Based on the NRC staff's review of models discussed in the NRC FHRR staff assessment and provided by the licensee as part of the MSA submittal, the staff determined that the licensee's FED parameters are reasonable for use as part of the MSA review.

3.2.2 Evaluation of Flood Associated Effects

The NRC staff reviewed the information provided by the licensee regarding associated effects (AE) parameters for flood hazards not bounded by the CDB. The AE parameters related to water surface elevation (i.e., stillwater elevation with wind waves and run-up effects) were previously reviewed by staff, and were transmitted to the licensee via the ISR letter. The AE parameters not directly associated with water surface elevation are discussed below and are summarized in Table 3.2.2-1 of this assessment.

For the LIP flood-causing mechanism, the licensee reported in its MSA letter that the maximum hydrodynamic and hydrostatic loads are 7.42 $lb/ft.^2$ and 127.11 $lb/ft.^2$, respectively. The licensee also stated that the other associated effects of LIP flooding, including debris load, sediment load, groundwater ingress, concurrent conditions, and other factors, are considered minimal or not applicable due to the relatively slow water velocities and low flow depths within the protected area. The staff confirmed these statements by reviewing the licensee-provided revised LIP model input and output files. The staff found that the estimated inundation depths and water velocities are acceptable and that the modeling is reasonable for use in the MSA. The staff agrees with the licensee's conclusion that the other AE parameters for the LIP flood-causing mechanism are either minimal or not applicable.

For the combined dam failure flood-causing mechanism, the licensee estimated a maximum hydrostatic load of 86.1 $lb/ft.^2$, with a maximum hydrodynamic load of 28 $lb/ft.^2$. The maximum debris impact point load is estimated to be 3,936 lb along the VBS. The licensee stated that the portions of the site within the VBS were protected from wind-waves. All other AE parameters are also minimal or not applicable. The staff reviewed the methodologies and the input parameter values used to estimate the hydrostatic, hydrodynamic and impact point loads. Based on this review, the staff found that the AE parameters are acceptable and the assumptions are reasonable for use as part of the MSA review

In summary, the staff determined the licensee's methods were appropriate and the provided AE parameters are reasonable for use in the MSA.

3.3 Evaluation of Modified FLEX Strategies

The licensee stated in the Farley MSA that the overall plant response strategies to an ELAP event using the current FLEX procedures, equipment, and personnel can be implemented as intended provided that Abnormal Operating Procedure (AOP) FNP-0-AOP-21.0, "Severe Weather," is updated to direct the pre-staging of FLEX equipment when river stages are forecasted to exceed 150 ft. This update is necessary because although the combined effects flooding hazard does not impact plant buildings, the maximum stillwater elevation flooding would inundate a portion of the FLEX haul paths. For this flooding hazard, the licensee's analysis shows that a warning time of 47 hours would be available, which would be sufficient to deploy FLEX equipment prior to the flood elevation inundating portions of the haul paths.

The licensee also included three other planned minor modifications to mitigate the reevaluated flooding hazards:

- Procedures will be updated to direct plant personnel as to which doors of safety-related structures could potentially be inundated during a LIP event or other rain event of similar magnitude;
- Uncapped condulets in the Units 1 and 2 condensate pipe trenches will be capped to prevent a potential flooding pathway; and
- Penetrations in the refueling and reactor makeup water pipe trenches will be walked down and sealed as necessary to prevent a potential flooding pathway.

The staff notes that procedural revisions and flood protection modifications that the licensee describes in its MSA are subject to future NRC inspection.

Consistent with NEI 12-06, Section G.4.2, the licensee identified the impacts of the reevaluated flood hazard to the Farley FLEX strategies and confirmed that a revised sequence of events and FLEX procedures are not required once flood preparation procedures are revised. Since warning time is available prior to the onset of the combined effects flooding event at the site, the NRC staff finds that it is reasonable that the FLEX strategies, using current FLEX procedures, equipment, and personnel can be implemented as intended if the site abnormal weather procedure is revised as discussed in the Farley MSA.

4.0 CONCLUSION

The NRC staff has reviewed the information presented by the licensee in the MSA for Farley. The NRC staff confirmed that the licensee's flood hazard MSA for Farley was performed consistent with the guidance in Appendix G of NEI 12-06, Revision 2, as endorsed by JLD-ISG-2012-01, Revision 1. Based on the licensee's use of the hazard characterized in the NRC staff's ISR letter, the methodology used in the Farley MSA evaluation, and the description of its current FLEX strategy in the Farley MSA and supporting documentation, the NRC staff concludes that the licensee has demonstrated that the mitigation strategies appear to be reasonably protected from reevaluated flood hazards conditions.

Table 3.2.0-1. Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Flood Causing Mechanism	Stillwater Elevation (ft. NGVD 29)	Waves/Runup	Reevaluated Hazard Elevation (ft. NGVD 29)
Local Intense Precipitation and Associated Drainage	155.35 (See Table 3.2.0.2)	Minimal	155.35 (See Table 3.2.0.2)
Failure of Dams and Onsite Water Control/Storage Structures (Piping Dam Failure Combined with PMF, Embankment Seepage, and Wind Run-up)	[redacted]	[redacted]	[redacted]

Table 3.2.0-2. Comparison of Maximum LIP Flood Elevations between ISL (MSFHI Table 2) and MSA

Location	ISL (ft. NGVD 29) (a)	MSA (ft. NGVD 29) (b)	Difference (ft.) (b)-(a)
Auxiliary Unit 1	155.8	155.10	-0.70
Auxiliary Unit 2	155.8	155.11	-0.69
Containment Unit 1	155.2	154.86	-0.34
Containment Unit 2	156.0	154.89	-1.11
Diesel Generator	155.4	155.35	-0.05

Table 3.2.1-1. Flood Event Durations for Flood-Causing Mechanisms Not Bounded by the CDB

Flood-Causing Mechanism	Time Available for Preparation for Flood Event	Duration of Inundation of Site	Time for Water to Recede from Site
Local Intense Precipitation and Associated Drainage	Use NEI 15-05 (NEI, 2015) for warning time	Up to 1.4 hours	Up to 1.9 hours
Failure of Dams and Onsite Water Control/Storage Structures (Piping Dam Failure Combined with PMF, Embankment Seepage, and Wind Run-up)	47 hours	15 hours	0 hours

Table 3.2.2-1. Associated Effects Parameters Not Directly Associated with Total Water Height for Flood-Causing Mechanisms Not Bounded by the CDB

Associated Effects Parameter	Local Intense Precipitation and Associated Drainage	Failure of Dams and Onsite Water Control/Storage Structures (Piping Dam Failure Combined with PMF, Embankment Seepage, and Wind Run-up)
Hydrodynamic loading at plant grade	7.42 lb/ft. for hydrodynamic, 127.11 lb/ft. for hydrostatic	86.1 psf
Debris loading at plant grade	Minimal	3,936 lbs at the VBS
Sediment loading at plant grade	Minimal	Minimal
Sediment deposition and erosion	Minimal	Minimal
Concurrent conditions, including adverse weather	Not Applicable	Not Applicable
Groundwater ingress	Not Applicable	Not Applicable
Other pertinent factors (e.g., waterborne projectiles)	Not Applicable	Not Applicable

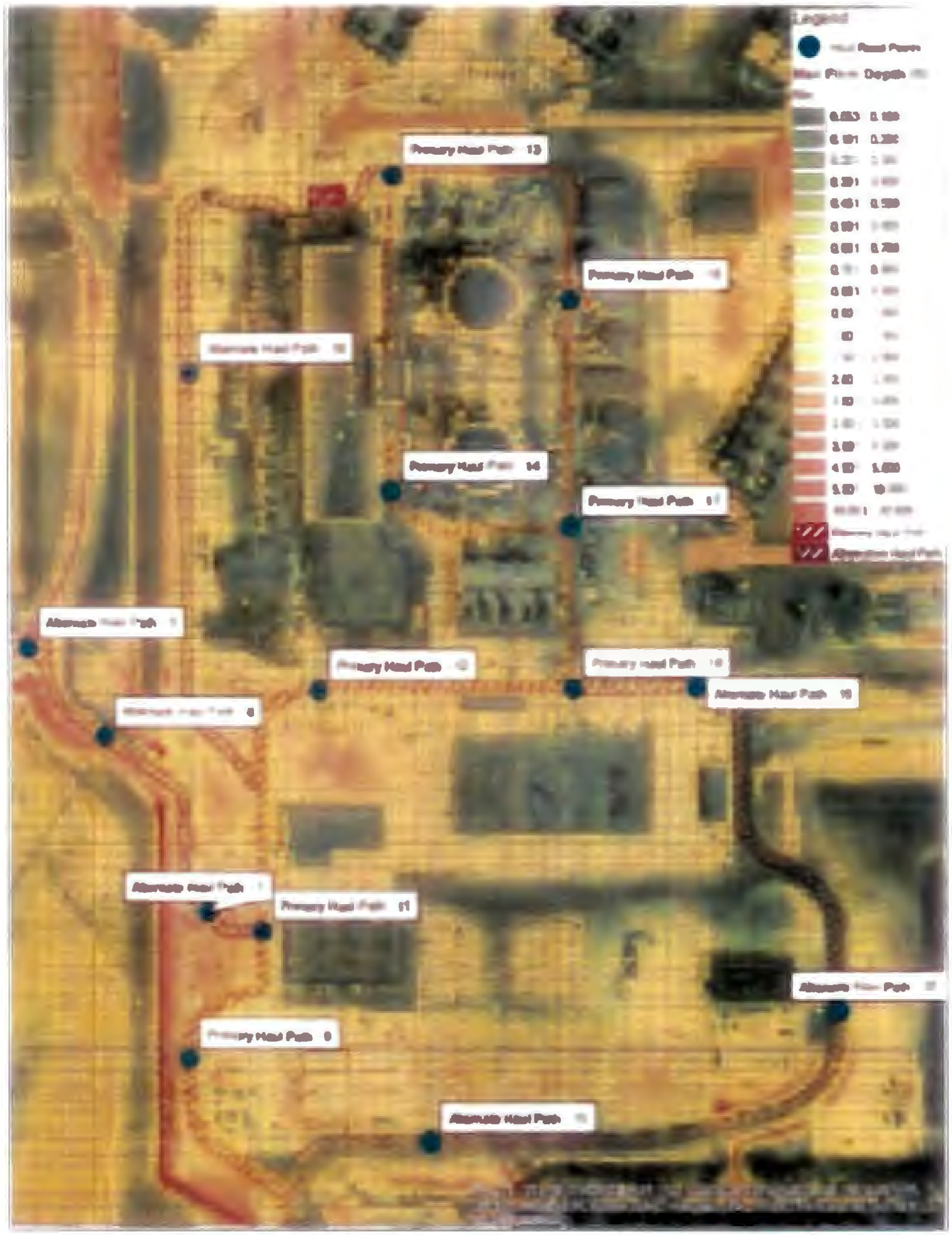

Figure 3.2.0-1. Site Map with Maximum LIP Flooding Depths, taken from the Farley MSA letter

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 – FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT DATED JULY 18, 2017

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